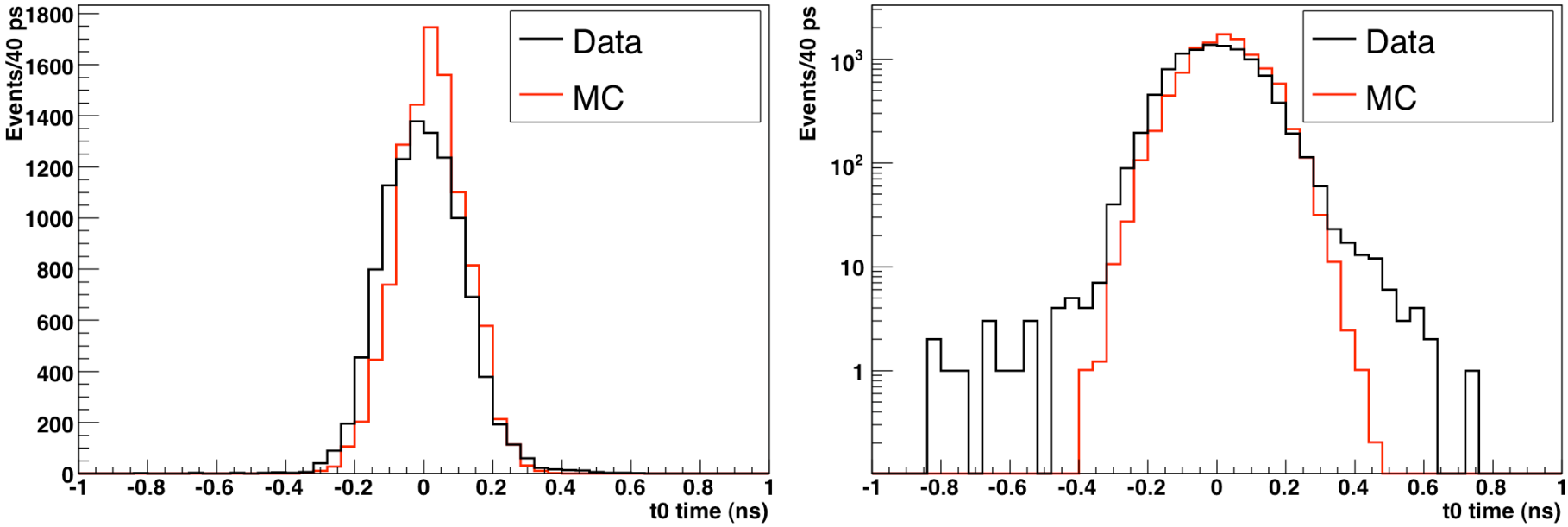
- **T0 Digitization:**
  - Get hit time → add an offset to make the time "positive"[Offset = time from beam-vertex to T01/TBD + constant] → Add propagation time to PMT → add jitter → convert to TDC
  - No slewing, time-dependent corrections etc as is done for data.
- In T0Reco, there is no information about the position of the hit (*i.e.* where the beam track hits the counter) Hence, in the reco stage I treat the propagation time in the scintillator as a constant offset (= propagation time from the center to the PMT) which I subtract.
- Left: t0 time - Data vs MC. Run 15118 - NuMI.MC mean is off by ~0.05ns.
- Right: Log scale

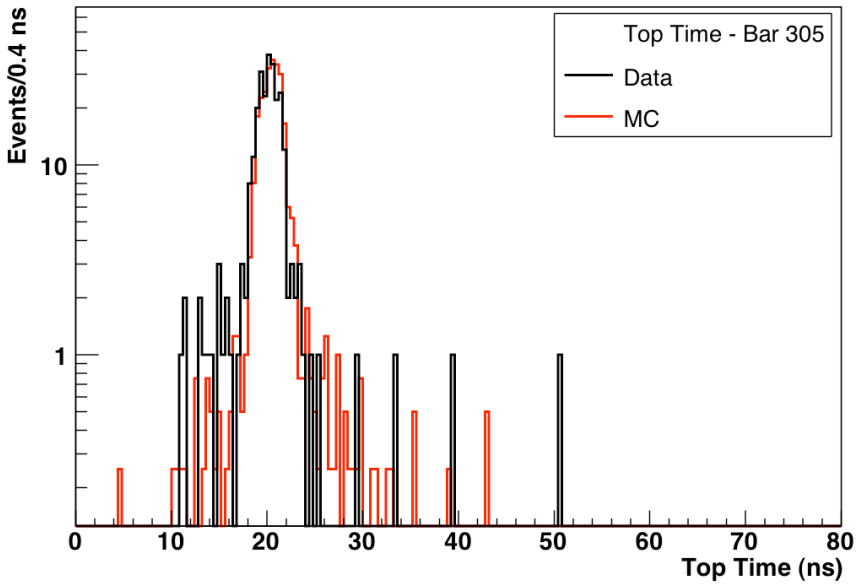


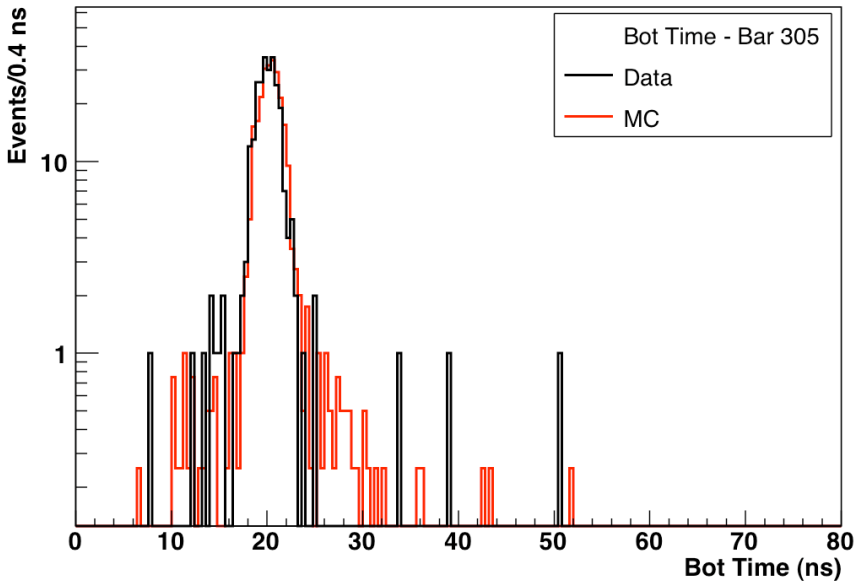
TOF Digitization

- Previously, the MC DST showed an offset of ~10ns in $t_{measured}$ when compared with t_{pred}. This was caused by not adding the time from T01→vertex in the digitizer. Now fixed by tracking the hit back to the target vertex and adding the flight time to T01.

- MC was also narrower by ~0.2ns. I have now added a jitter to the digitizer.

- Digitized and reconstructed 4 MC subruns from Run 20015118 (NuMI) and compared with corresponding Data.
- Both data and MC DSTs analyzed exactly the same way using functions from DSTUtil to get clean tracks in the TOF.

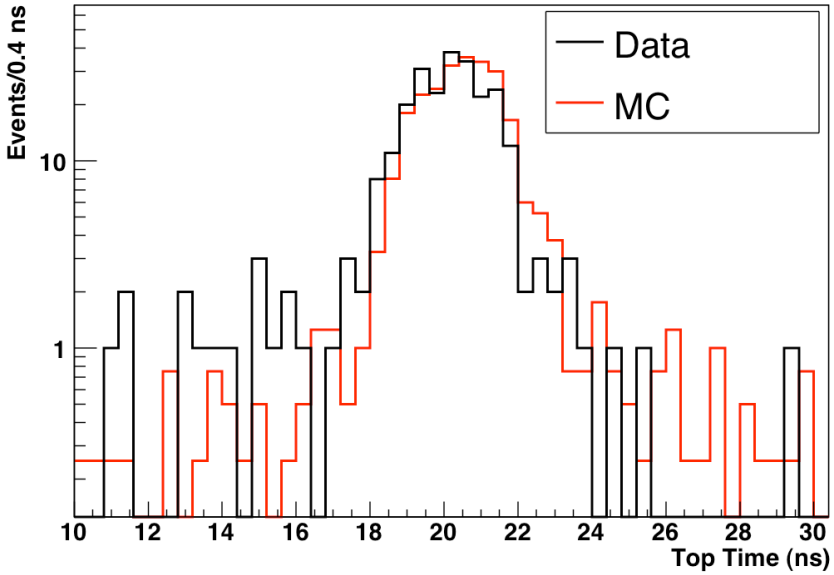


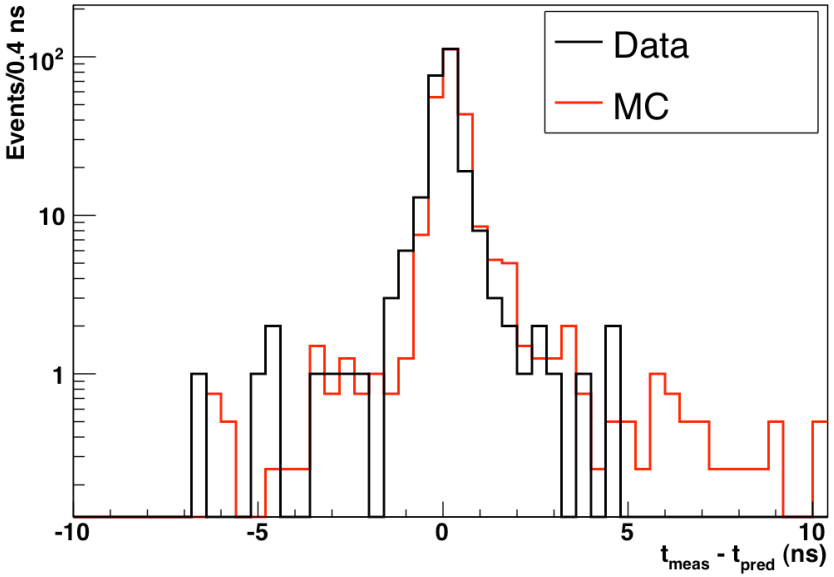


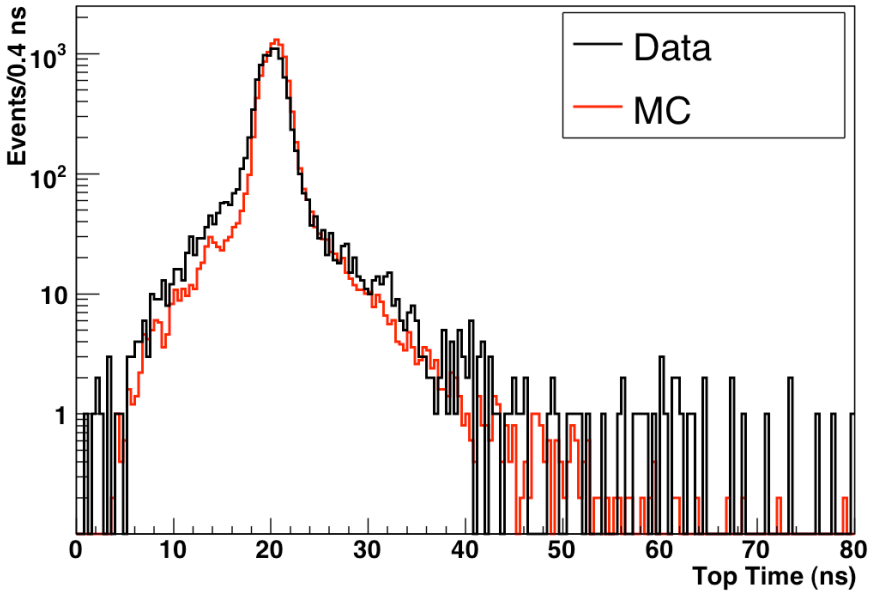
- **Top:** PMT top (left) and bottom (right) times for bar 305.

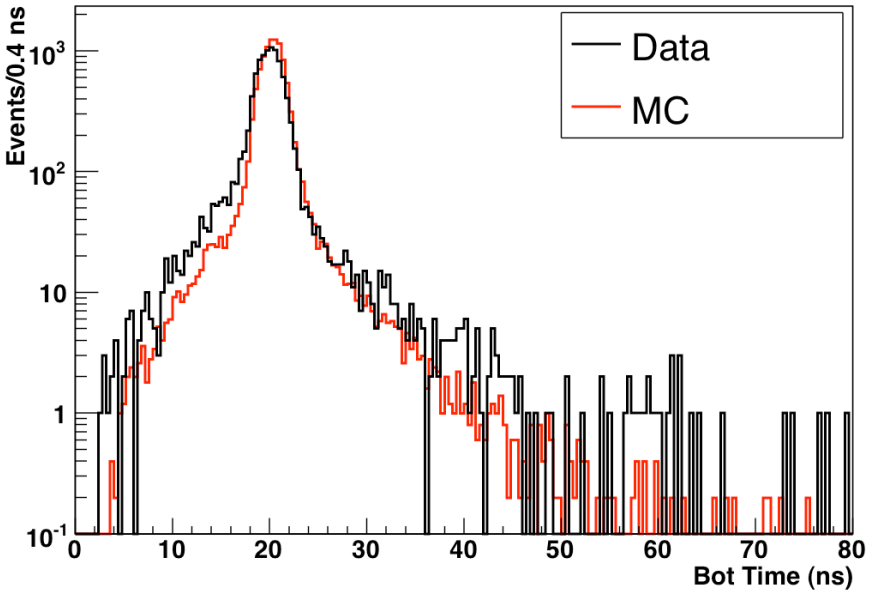
- **Bot Left:** Top Time in a narrower range.

Bot Right: t(measured) - t(pred) for bar 305

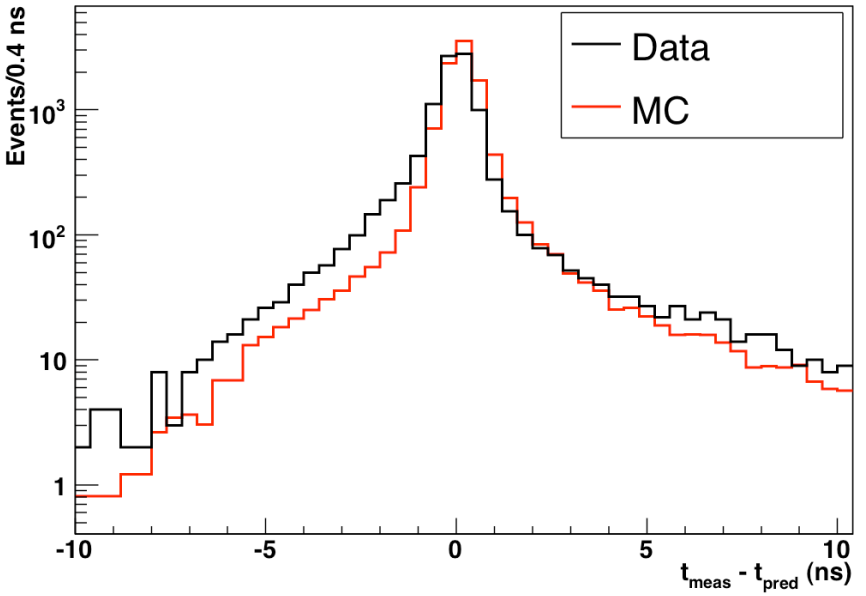


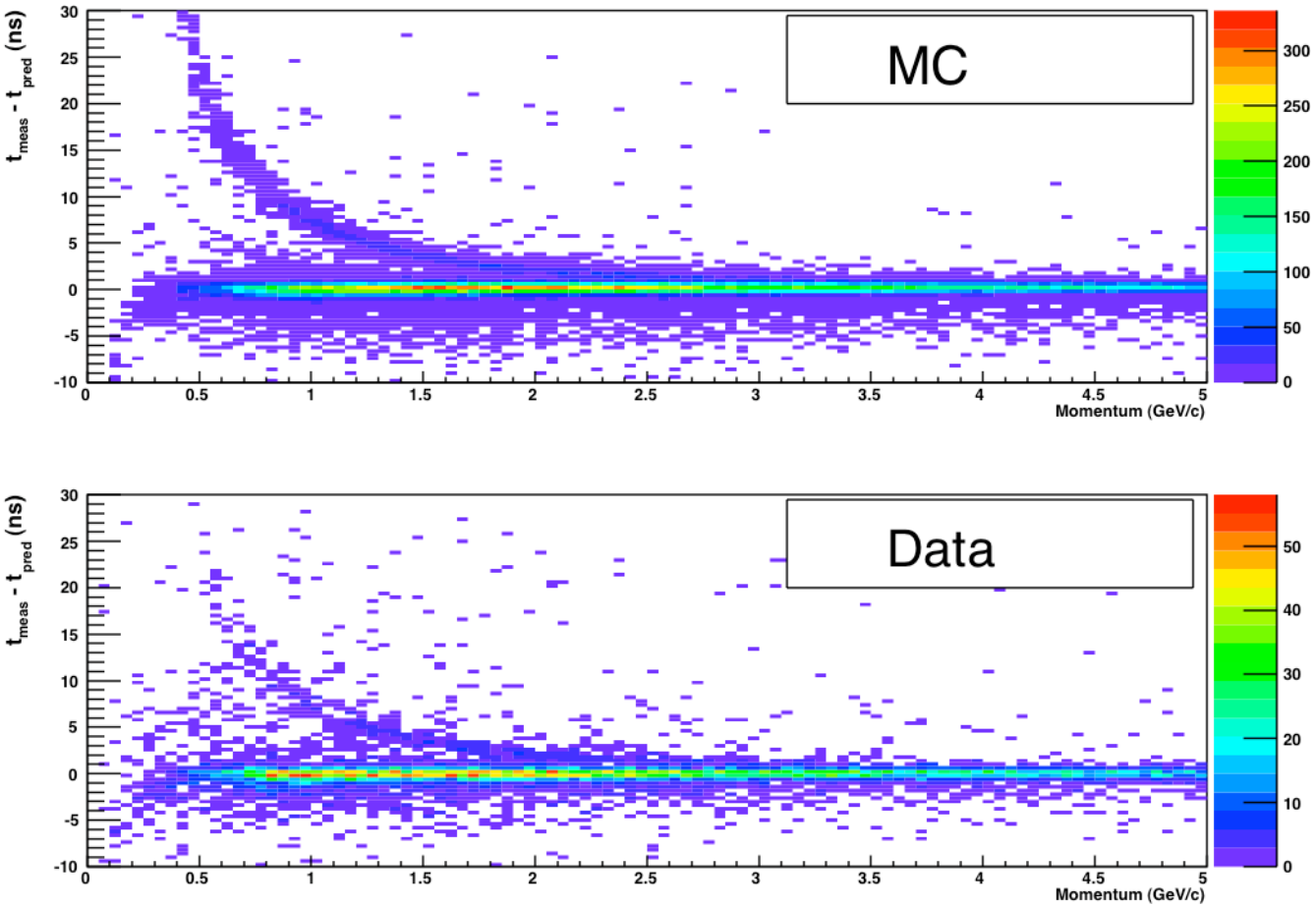






- **Top:** PMT top (left) and bottom (right) times for ALL bars.
- Means agree quite well and the widths are now reasonable but some discrepancy on the left shoulder. There is also a small bump in the MC on the left shoulder - not sure where that is coming from.
- **Bot:** t(measured) - t(pred) for all bars.





- T(measured)-t(predicted) vs Momentum for MC and Data, all bars, Run 15118 (NuMI). MC a lot cleaner between the π and p bands.
- To Do:
  - compare data/MC for thin and LH2 targets and perhaps lower momentum run just to make sure.
  - Had loaded ADCs into DB for NuMI runs - probably works fine for thin targets, too; but HV changed ~Run 15690 so need to put those in so that the ADC-based slewing is handled correctly in the MC for those runs.